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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : C08F 4/60, 10/00, 110/02, 110/06, 110/14, 210/02, 210/06, 210/14, 23/16, C09J 123/00, C10M 119/00, C09D 123/00, C08J 5/18, C08F 32/04, 214/18, 220/22, C08G 61/04, C07C 251/00		A3	(11) International Publication Number: WO 96/23010
			(43) International Publication Date: 1 August 1996 (01.08.96)
(21) International Application Number: PCT/US96/01282		(74) Agents: EVANS, Craig, H. et al.; E.I. du Pont de Nemours and Company, Legal Patent Records Center, 1007 Market Street, Wilmington, DE 19898 (US).	
(22) International Filing Date: 24 January 1996 (24.01.96)			
(30) Priority Data:		(81) Designated States: AL, AM, AU, BB, BG, BR, CA, CN, CZ, EE, FI, GE, HU, IS, JP, KP, KR, LK, LR, LT, LV, MD, MG, MK, MN, MX, NO, NZ, PL, RO, SG, SI, SK, TR, TT, UA, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AZ, BY, KG, KZ, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).	
08/378,044 24 January 1995 (24.01.95) US		<p>Published</p> <p><i>With international search report.</i></p> <p><i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>	
08/415,283 3 April 1995 (03.04.95) US			
08/473,590 7 June 1995 (07.06.95) US			
60/007,375 8 August 1995 (08.08.95) US			
60/002,654 22 August 1995 (22.08.95) US			
(71) Applicants: E.I. DU PONT DE NEMOURS AND COMPANY [US/US]; 1007 Market Street, Wilmington, DE 19898 (US). UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL [US/US]; Office of Technology Development, Campus Box 4105, 308 Bynum Hall, Chapel Hill, NC 27599-4105 (US).			
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(88) Date of publication of the international search report: 5 December 1996 (05.12.96)			
(54) Title: α -OLEFINS AND OLEFIN POLYMERS AND PROCESSES THEREFOR			
(57) Abstract			
<p>Disclosed herein are processes for polymerizing ethylene, acyclic olefins, and/or selected cyclic olefins, and optionally selected olefinic esters or carboxylic acids, and other monomers. The polymerizations are catalysed by selected transition metal compounds, and sometimes other co-catalysts. Since some of the polymerizations exhibit some characteristics of living polymerizations, block copolymers can be readily made. Many of the polymers produced are often novel, particularly in regard to their microstructure, which gives some of them unusual properties. Numerous novel catalysts are disclosed, as well as some novel processes for making them. The polymers made are useful as elastomers, molding resins, in adhesives, etc. Also described herein is the synthesis of linear α-olefins by the oligomerization of ethylene using as a catalyst system a combination of a nickel compound having a selected α-diimine ligand and a selected Lewis or Bronsted acid, or by contacting selected δ(a)-diimine nickel complexes with ethylene.</p>			

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INTERNATIONAL SEARCH REPORT

Intern. Application No

PCT/US 96/01282

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 C08F4/60 C08F10/00 C08F110/02 C08F110/06 C08F110/14
 C08F210/02 C08F210/06 C08F210/14 C08L23/16 C09J123/00
 C10M119/00 C09D123/00 C08J5/18 C08F32/04 C08F214/18

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 C08F C08L C08G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 93 13140 A (EXXON CHEMICAL PATENTS INC) 8 July 1993 see table II	1-6,332, 333,358, 359,366, 384-415, 420-438, 539-554, 560-562
A	EP 0 446 013 A (TOSOH CORP) 11 September 1991 see the whole document	1-6,332, 333,358, 359,366, 384-415, 420-438, 539-554, 560-562



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

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A document member of the same patent family

Date of the actual completion of the international search

4 October 1996

Date of mailing of the international search report

21. 10. 96

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INTERNATIONAL SEARCH REPORT

International Application No

PCT / US 96 / 01282

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 6 C08F220/22 C08G61/04 C07C251/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 208 309 A (MCDANIEL MAX P ET AL) 4 May 1993 see claims	1,2,4,5, 366, 384-415, 421,422, 426-438, 539-544, 560-562
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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US96/01282

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INTERNATIONAL SEARCH REPORT

Internat'l Application No

PCT/US 96/01282

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INTERNATIONAL SEARCH REPORT

International Application No

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Y	see claims; examples 10,11	31-36
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INTERNATIONAL SEARCH REPORT

Internat. Application No

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
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X	CHEMICAL ABSTRACTS, vol. 77, no. 8, 21 August 1972 Columbus, Ohio, US; abstract no. 49803, "MONTECATINI" SOCIETA GENERALE PER L'INDUSTRIA MINERIA E CHIMICA: "Catalytic manufacture of olefin copolymers with three or more monomer components" XP002015133	361-363, 520
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INTERNATIONAL SEARCH REPORT

Internat. Application No.

PCT/US 96/01282

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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X	ZEITSCHRIFT FÜR NATURFORSCHUNG, vol. 45b, - 1990 TÜBINGEN, XP002015132 BONRATH, W. ET AL.: "Synthese und Struktur von Ni(2,6-iPr ₂ C ₆ H ₃ N=CH-CH=NC ₆ H ₃ -2,6-iPr ₂) ₂ " see page 1647 - page 1650 -----	239,240, 243-252

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 96/01282

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: 395
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
Claim 395 is a product claim and refers back to claim 14, which is a process claim

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

SEE FURTHER INFORMATION SHEET

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/210

1. Claims : 1-25, 37-238, 243-344, 358, 359, 366 as far as they relate to claims 358, 367-394, 396-509, 510-520 and 523-527 as far as they relate to claims 358, 528-552, 554-562.
2. Claims : 26-36
3. Claims : 239-242
4. Claims : 345-357, 360-365, 366 as far as they relate to all mentioned claims except 358, 510-527.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 96/01282

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Information on patent family members

International Application No

PCT/US 96/01282

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 96/01282

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